

Claims

1. A light modulator retainer for retaining a light modulator that modulates an incoming light flux in accordance with image information, comprising:

a rectangular plate-like body having an opening section at a substantially center thereof for passing through the incoming light flux;

a pair of standing pieces protruding from a pair of parallel side edges of the rectangular plate-like body, and extending along a direction into which an end edge of the rectangular plate-like body extends;

an extension section provided at a tip of each of the standing pieces to extend toward the opposing standing piece; and

a light modulator fixing section formed at a tip of the extension section for fixing the light modulator, wherein a space enclosed by the rectangular plate-like body and the pair of standing pieces is inserted with at least one or more of optical conversion elements each including a substrate formed with an optical conversion film for converting an optical property of the incoming light flux, wherein the optical conversion element is fixed with biased in a thickness direction of the substrate by a bias member.

2. The light modulator retainer according to claim 1, further comprising:

the light modulator includes a light modulation element performing light modulation, and a retaining frame having an opening section corresponding to an image formation region of the light modulation element and being formed with at least two holes,

the extension section is so formed as to correspond to the hole of the retaining frame, and

the light modulation fixing section is a pin protruding from the extension section to be inserted into the hole of the retaining frame.

3. The light modulator retainer according to claim 2, wherein the light modulator fixing section is tapered, narrowing from a base end side toward a tip end side.

4. The light modulator retainer according to claim 1, wherein inner surfaces a protrusion section extending along an insertion direction of the optical conversion element at the inner of the pair of standing pieces, and wherein the bias member biases the substrate of the optical conversion element to the protrusion section.

5. The light modulator retainer according to claim 4, wherein, the bias member includes an engagement section for engaging with an optical element insertion side end part of the standing piece, and a spring-like section formed at an end part of the engagement section extending outward, to bias the substrate by abutting to the substrate of the optical conversion element.

6. The light modulator retainer according to claim 1, wherein, the rectangular plate-like body or the standing piece is formed with a support surface for supporting an end part of the optical conversion element, which is inserted into the space enclosed by the rectangular plate-like body and the pair of standing pieces.

7. The light modulator retainer according to claim 1, wherein, the rectangular plate-like body is formed with a notch for absorbing any change caused by heat.

8. An optical device comprising:

a plurality of light modulators for modulating a plurality of color light beams in accordance with image information on a color light beam basis;

a color synthesizing optical unit for synthesizing the color light beams ,

which are modulated by the light modulators, wherein the light modulators and the color synthesizing optical unit are integrally formed;

a plurality of light modulator retainers for retaining the plurality of light modulators; and

at least one optical conversion element including an optical conversion film formed on a substrate for converting an optical property of an incoming light flux, wherein the light modulator retainer includes a rectangular plate-like body having an opening section at a substantially center thereof for passing the incoming light flux; a pair of standing pieces, which protrude from a pair of parallel side edges of the rectangular plate-like body and extend along a direction into which an end edge of the rectangular plate-like body extends; an extension section provided at a tip of each of the standing pieces to extend toward the opposing standing piece; a light modulator fixing section formed at a tip of the extension section for fixing the light modulator; and a bias member for fixing the optical conversion element to the light modulator retainer, wherein at least one optical conversion element is inserted into a space, which is enclosed by the rectangular plate-like body and the pair of standing pieces and fixed to the light modulation retainer with biased in a thickness direction of the substrate of the optical conversion element by the bias member, and the light modulator is fixed to the color synthesizing optical device via the light modulator retainer.

9. The optical device according to claim 8, wherein the light modulator includes a light modulation element performing light modulation, and a retaining frame, which has an opening section corresponding to an image formation region of the light modulation element and is formed with at least two holes, wherein the extension section of the light modulator retainer is so formed as to correspond to the

holes of the retaining frame of the light modulator, and wherein the light modulator fixing section is a pin protruding from the extension section to be inserted into the hole of the retaining frame.

10. The optical device according to claim 9, wherein the light modulator fixing section is tapered, narrowing from a base end side toward a tip end side.

11. The optical device according to claim 8, a protrusion section extending along an insertion direction of the optical conversion element is formed at the inner surface of the pair of the standing pieces of the light modulator retainer, and wherein the bias member biases the substrate of the optical conversion element to the protrusion section.

12. The optical device according to claim 11, wherein the bias member of the light modulator retainer includes an engagement section for engaging with an optical element insertion side end part of the standing piece, and a spring-like section formed at an end part of the engagement section extending outward, to bias the substrate of the optical conversion element by abutting to the substrate.

13. The optical device according to claim 8, wherein the rectangular plate-like body or the standing piece of the light modulator retainer is formed with a support surface for supporting an end part of the optical conversion element to be inserted into the space enclosed by the rectangular plate-like body and the pair of standing pieces.

14. The optical device according to claim 8, wherein the rectangular plate-like body of the light modulator retainer is formed with a notch for absorbing any change caused by heat .

15. The optical device according to claim 8, wherein the optical conversion element to be inserted into the space enclosed by the rectangular plate-like body and

the pair of standing pieces of the light modulator retainer is a polarization element for converting a polarization axis of the incoming light flux, and the polarization element has two or more polarization films whose polarization axes are parallel to each other and whose light absorption property is different.

16. The optical device according to claim 15, wherein the optical conversion element including the substrate formed with the at least two or more polarization films is so placed as to sandwich the protrusion section, and the substrate thereof is fixed with biased by the bias member, and wherein the at least two or more polarization films are placed with a certain space therebetween by the protrusion section.

17. The optical device according to claim 8, wherein a back surface of the rectangular plate-like body formed with the standing piece of the light modulator retainer is fixed to the color synthesizing optical device using a thermosetting adhesive or a light curing adhesive, and wherein a back surface of the rectangular plate-like body is grain-finished.

18. The optical device according to claim 8, wherein the rectangular plate-like body of the light modulator retainer has an indented section formed at a part of an end surface fixed to the color synthesizing optical device.

19. The optical device according to claim 8, wherein a support surface is formed at a tip of the standing piece of the light modulator retainer for supporting other optical conversion elements.

20. The optical device according to claim 8, wherein the standing piece is so formed as to have the same length as a pair of parallel side edges of the rectangular plate-like body.

21. A projector comprising:

a light source;

an optical device in which a plurality of light modulators for modulating a plurality of color light beams in accordance with image information on a color light beam basis and a color synthesizing optical device for synthesizing the color light beams having been subjected to modulation by the light modulators;

a projection optical system for enlarging and projecting an optical image to be emitted from the optical device;

a plurality of light modulator retainers for retaining the plurality of light modulators, and

at least one optical conversion element including an optical conversion film formed on a substrate for converting an optical property of an incoming light flux, wherein the light modulator retainer includes: a rectangular plate-like body having an opening section at a substantially center thereof for passing the incoming light flux; a pair of standing pieces, which protrude from a pair of parallel side edges of the rectangular plate-like body and extend along a direction into which an end edge of the rectangular plate-like body extends; an extension section provided at a tip of each of the standing pieces to extend toward the opposing standing piece; a light modulator fixing section formed at a tip of the extension section for fixing the light modulator; and a bias member for fixing the optical conversion element to the light modulator retainer,

and wherein the at least one optical conversion element is inserted into a space enclosed by the rectangular plate-like body and the pair of standing pieces to be fixed to the light modulator retainer with biased in a thickness direction of the substrate of the optical conversion element by the bias member; and the light modulator is fixed to the color synthesizing optical device via the light modulator retainer.

22. The projector according to claim 21, wherein the light modulator includes a light modulation element performing light modulation, and a retaining frame, which has an opening section corresponding to an image formation region of the light modulation element and is formed with at least two holes, the extension section of the light modulator retainer is so formed as to correspond to the holes of the retaining frame of the light modulator, and the light modulator fixing section is a pin protruding from the extension section to be inserted into the hole of the retaining frame.

23. The projector according to claim 22, wherein the light modulator fixing section is tapered, narrowing from a base end side toward a tip end side.

24. The projector according to claim 21, wherein inner surfaces of the pair of standing pieces of the light modulator retainer are each formed with a protrusion section extending along an insertion direction of the optical conversion element, and the bias member biases the substrate of the optical conversion element to the protrusion section.

25. The projector according to claim 14, wherein the bias member of the light modulator retainer includes an engagement section for engaging with an optical element insertion side end part of the standing piece, and a spring-like section formed at an end part of the engagement section extending outward, to bias the substrate of the optical conversion element by abutting to the substrate.

26. The projector according to claim 21, wherein the rectangular plate-like body or the standing piece of the light modulator retainer is formed with a support surface for supporting an end part of the optical conversion element to be inserted into a space enclosed by the rectangular plate-like body and the pair of standing pieces.

27. The projector according to claim 21, wherein the rectangular plate-like body of the light modulator retainer is formed with a notch for absorbing any change caused by heat.

28. The projector according to claim 21, wherein the optical conversion element to be inserted into the space enclosed by the rectangular plate-like body and the pair of standing pieces of the light modulator retainer is a polarization element for converting a polarization axis of the incoming light flux, and wherein the polarization element has at least two or more polarization films whose polarization axes are parallel to each other and whose light absorption property is different.

29. The projector according to claim 28, wherein the optical conversion element including the substrate formed with the at least two or more polarization films is so placed as to sandwich the protrusion section, and the substrate thereof is biased by the bias member, and the at least two or more polarization films are placed with a certain space therebetween by the protrusion section.

30. The optical device according to claim 21, wherein
a back surface of the rectangular plate-like body formed with the standing piece of the light modulator retainer is fixed to the color synthesizing optical device using a thermosetting adhesive or a light curing adhesive, and the back surface of the rectangular plate-like body is grain-finished.

31. The optical device according to claim 21, wherein
the rectangular plate-like body of the light modulator retainer has an indented section formed at a part of an end surface fixed to the color synthesizing optical device.

32. The optical device according to claim 21, wherein
a support surface is formed at a tip of the standing piece of the light

modulator retainer for supporting other optical conversion elements.

33. The optical device according to claim 21, wherein
the standing piece is so formed as to have the same length as a pair of
parallel side edges of the rectangular plate-like body.